



**U. S. ENVIRONMENTAL PROTECTION AGENCY  
REGION 4**

**SUPERFUND FACT SHEET  
RESULTS OF EPA GAMMA RADIATION SURVEYS AND  
SAMPLING OF SLAG MATERIALS TAKEN IN THE TARPON  
SPRINGS AREA IN JUNE - AUGUST 1998**

January 1998

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The U.S. Environmental Protection Agency (EPA) Region 4 conducted surveys and sampling for gamma radiation and non-radiological contaminants in Tarpon Springs, Florida and the surrounding counties in June, July, and August of 1998. These activities were requested by local residents who felt that contaminants may have been, distributed from the Stauffer Chemical Company Superfund site in Tarpon Springs (site) into the surrounding communities and may be adversely affecting their health. This fact sheet highlights EPA's sampling activities and summarizes a concurrent health assessment conducted by the Agency for Toxic Substances and Disease Registry (ATSDR). Also, the fact sheet provides interpretation of the results and, recommendations, and proposed dates for the public meeting.

**PUBLIC MEETING**

EPA will hold a public meeting to discuss the Offsite Sampling Results on January 28, 1999 at the Tarpon Springs High School from 6:30 until 7:30p.m. located at 1411 Gulf Road West, Tarpon Springs, Florida. Please read the information contained within this fact sheet, and prepared all questions in writing prior to the meeting in order to abide by the time-frame allotted by this facility.

**INVESTIGATION BACKGROUND**

Local residents expressed concerns that slag was

transported from the Stauffer Chemical Company (Tarpon Springs) site and used as a construction material in roads, driveways, houses, and other

structures in the communities surrounding the site (offsite areas). The Stauffer Chemical Company and their predecessor manufactured elemental phosphorous from 1947 until 1981 using phosphate ore mined from deposits in Florida. A by-product of the elemental phosphorous production process was phosphate slag (slag). The rock-like slag material contains radium-226 and a host of metallic contaminants.

#### Past Surveying/Sampling Activities - State of Florida

The Florida Department of Environmental Protection (FDEP) and the Florida Department of Health, Bureau of Radiation Control (DOH-BRC) conducted gamma radiation surveys on roadways, driveways, and building interiors and analyzed 10 slag samples for the presence of nine non-radiological, site-related contaminants in July through December 1997. Based on these analyses, the Florida Department of Health prepared a health consultation which recommended no further action.

#### EPA Region 4 Surveying and Sampling Activities

At the request of the community, EPA agreed to expand the previous FDEP and DOH-BRC activities by conducting additional gamma radiation surveys, and collecting and evaluating additional samples of roads, driveways, yards, and home interiors in the City of Tarpon Springs and surrounding areas in Pinellas and Pasco Counties. The EPA conducted these activities in June through August 1998 as discussed below:

#### June 25, 1998 Gamma Radiation Screening Surveys by EPA

The EPA conducted gamma radiation screening surveys in two homes, four driveways, and three roadways, using a Ludlum Model 19 Micro R meter (Ludlum) to determine the best sampling locations. The Ludlum, which is calibrated to Cesium-137, provides a conservative result when surveying for Radium-226. EPA used the results of these surveys, combined with review of the previous DOH-BRC surveys and discussions with residents, as a basis for selecting locations for the July sampling event.

#### July 7-10, 1998 Sampling Event by EPA

The U.S. EPA's Science and Ecosystems Support Division, Athens, GA (SESD) collected 26 samples as shown in Table 1 (plus QA/QC and background samples) and shipped them to EPA's National Air

and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama for chemical and radiological analysis. The purpose of the analysis was to determine the presence and concentrations of site-related radiological and non-radiological contaminants in the samples. The site-related contaminants evaluated are discussed in the Results section below. In addition, the EPA sent two samples from the offsite areas and one sample from the site to the Idaho National Engineering and Environmental Laboratory (INEL) for visual and microscopic comparison. The purpose of this analysis was to determine whether the offsite slag materials could be scientifically "fingerprinted" to the Stauffer slag.

<b>Table 1 - Sampling Locations July 7-10, 1998</b>	
<b>Media</b>	<b>Number of Samples</b>
Driveway Paving	4
Driveway Base	4
Road Paving	4
Road Base	4
Yard Soils	4
Slag Pile in Yard	1
Basement Slab on Grade	1
Basement Slab Base	1
Right of Way Paving	1
Right of Way Base	1
Stauffer Slag Field	1

#### August 23-26, 1998 Re-Surveying of Homes for Interior Gamma Dose

During the gamma radiation screening surveys conducted by EPA using the Ludlum, it was determined that four homes exceeded interior gamma dose levels recommended by 40 CFR Part 192, the "Uranium Mill Tailings Act" (20 uR/hr + background). The EPA and NAREL conducted additional surveys in these homes using a Pressurized Ionization Chamber (PIC) and a Bicon Microrem Meter. The PIC and Bicon meter measure all radioisotopes and measure body tissue dose; their results are more realistic.

## RESULTS

### Slag and Soil Sampling

All samples were evaluated for dermal contact, incidental ingestion, and inhalation, as if the slag was soil. While the crumbling of slag roads and generation of dust was observed during the gamma survey and sampling events, the evaluation of all slag material as loose soil is highly conservative.

### Carcinogens

Carcinogenic (cancer-causing) contaminants were evaluated in accordance with EPA's procedures for determining Total Lifetime Excess Cancer Risk (risk). EPA considers chemical concentrations posing a risk in excess of 1 in ten thousand ( $1 \times 10^{-4}$ ) to require further action. Soil in which the cumulative contaminant concentrations exceed the  $1 \times 10^{-4}$  risk (trigger concentration) would require EPA action. Table 2 provides a list of the site-related carcinogens evaluated, the maximum levels detected, trigger concentrations corresponding to the  $1 \times 10^{-4}$  risk, and the source of the trigger concentrations. Note that site-related carcinogenic polyaromatic hydrocarbons are not shown because they were not detected in the samples collected.

Table 2 - Site Related Carcinogens Detected in Offsite Areas - Maximum Concentrations			
Contaminant	Maximum Concentration Detected	$10^{-4}$ Trigger	Source
Arsenic	4.35 ppm	40 ppm	Site*
Ra-226 Ingestion	70.2 pCi/g	268 pCi/g	EPA Risk**
Ra-226 Inhalation	70.2 pCi/g	4807600 pCi/g	EPA Risk**

\*EPA Region 4 does not consider arsenic in soil to be a carcinogen; however, it does consider arsenic to be a carcinogen in drinking water. If the assumption was made that arsenic is a carcinogen in soil, then the safe soil level for children would be a  $10^{-6}$  risk level of 0.46 ppm; the  $10^{-4}$  trigger would be 100 times higher, approximately 46 ppm.

\*\* EPA calculated the trigger levels for ingestion and inhalation in accordance with the EPA's "Risk Assessment Guidance for Superfund."

The excess lifetime cancer risks due to all carcinogens from a given sample were added to determine if their combined effect exceeded the trigger of  $1 \times 10^{-4}$  for that sample. All samples were below the  $1 \times 10^{-4}$  trigger level.

**Conclusion: The total excess lifetime cancer risk at all sample locations was below the  $1 \times 10^{-4}$  trigger .**

Table 3 - Site Related Non-Carcinogens Detected in Offsite Areas - Maximum Concentrations			
Contaminant	Maximum Concentration Detected (ppm)	PRG (ppm)	Source
Aluminum	11900	72000	FAC
Antimony	0.298	26	FAC
Arsenic*	4.85	21	EPA
Barium**	136	5200	EPA
Beryllium	1.96	120	FAC
Cadmium	1.82	75	FAC
Chromium	49.6	290	FAC
Cobalt	7.55	4700	FAC
Copper**	54.8	2800	EPA
Iron	3500	23000	FAC
Lead	48	400	EPA
Manganese	187	1500	FAC
Mercury	0.0369	3.7	FAC
Nickel**	34.4	1500	EPA

Selenium	2	390	FAC
Silver	0.222	390	FAC
Thallium	0.7	6	EPA
Vanadium**	36.6	520	EPA
Fluoride***	1300	3900	EPA
Zinc	100	23000	FAC

\*The FAC does not provide PRGs for the non-carcinogenic effects of Arsenic or Thallium. EPA Region 9 risk-based numbers were used.

\*\* The FAC PRGs for these chemicals are based upon an acute (one time) exposure to a large amount of ingested soil. EPA PRGs are based on long-term chronic exposure to a typical amount of soil that would be ingested by incidental exposure. EPA believes the latter exposure scenario represents the appropriate basis for developing cleanup levels.

\*\*\*Samples were not evaluated for Fluoride; the concentration shown is from a previous on-site slag sample.

#### Non-Carcinogens

Non-carcinogenic contaminants (toxic but not cancer-causing) were evaluated by comparing the contaminant concentrations detected in the samples with established Preliminary Remediation Goals (PRGs) for specific target organs (such as nervous system, skin, small intestine, etc). The contaminants evaluated, maximum levels detected, PRGs, and the source of the PRGs are shown in Table 3. Table 3 consists entirely of metals. Volatiles were not detected in any of the samples. For each sample location, the hazard quotients for each contaminant were added to determine if their cumulative effect exceeded the total allowable hazard associated with non-carcinogenic contaminants (Hazard Index). In one case, this Hazard Index was exceeded. However, upon comparing the individual hazard quotients to the PRGs for each target organ, it was determined that the levels were acceptable.

**Conclusion: Non-carcinogenic contaminant concentrations are within acceptable levels at all locations.**

#### Whole-Body Gamma Radiation Dose

##### Gamma Radiation Dose Screening Criteria

There are numerous maximum recommended

radiation doses provided by several sources. These sources included the Florida Administrative Code (FAC), 40 CFR Part 192, National Council on Radiation Protection (NCRP), and Health Consultations issued by the ATSDR. Based upon the review of these screening criteria, the EPA selected the screening criteria for the analysis of the offsite areas as shown in Table 4. All readings were taken at waist level unless otherwise noted.

**Table 4**  
**Gamma Radiation Dose Screening Criteria**

Location Type	Suggested Criteria	Source
Interior Residential	20 uR/hr <sup>1</sup>	40 CFR 192
Total Residential Property <sup>2</sup>	200 mRem/yr <sup>1</sup>	ATSDR Health Consult <sup>4</sup>
Roadway <sup>3</sup>	500 mRem/yr <sup>1</sup>	NCRP and FAC

<sup>1</sup> All levels shown do **not** include background.

<sup>2</sup> 18 hrs/day in house, 2 outdoors, 350 days per year

<sup>3</sup> Walking on road for 2 hours/day, 350 days/year

<sup>4</sup> ATSDR 1992 Health Consult, Austin Ave. Radiation Superfund Site

#### Residential Gamma Dose Surveys - Home Interiors

EPA Region 4 surveyed five residential interiors. As noted previously, four of those interiors exceeded the 20 uR/hr +background dose recommended by 40 CFR Part 192 when surveyed using the Ludlum. When re-surveyed using the PIC, only one home remained above the recommended interior dose. Table 5 shows the results for those homes re-surveyed using the PIC.

<b>Table 5</b> <b>Average Interior Gamma Doses Using PIC</b> <b>Including Background*</b>		
Residence	Room Surveyed	Interior Gamma Dose - PIC
1	Basement	40 uR/hr
1	First Floor	17 uR/hr
2	Master BR	24 uR/hr
3	Living Room	20 uR/hr
4	Garage/Shop	23 uR/hr
* Ave Background in Florida is uR/hr. The criteria including background is 20 uR/hr + 6 uR/hr = 26 uR/hr.		

**Conclusion: One home exceeds the recommended criteria for interior gamma dose of 26 uR/hr including Background.**

#### Residential Gamma Dose Surveys - Driveways

EPA Region 4 surveyed five driveways. The results are shown in Table 6.

<b>Table 6</b> <b>Gamma Radiation Doses - Driveways</b>	
Driveway Location	Gamma Dose (uR/hr) (Incl. Background)
1	45
2	40
3	23
4	180
5	140

#### Residential Gamma Dose Calculations - Total Property

Table 7 illustrates the total gamma radiation dose of five properties sampled.

<b>Table 7</b> <b>Total Property Gamma Radiation Dose</b> <b>(Excluding Background)</b>			
Property	Interior Dose (mRem/yr)	Driveway Dose (mRem/yr)	Total Dose (mRem/yr)
1	205	28	233
2	87	13	100
3	59	122	181
4	0	94	94
5	114	24	138
6	107	Backgnd	107

**Conclusion: One whole property exceeds the criteria established for this analysis in Table 4; that exceedance is due primarily to the interior gamma dose as shown in table 6. Residential driveways do not exceed the recommended criteria.**

#### Gamma Radiation Dose Surveys -Roadways

EPA Region 4 surveyed four roadway locations. The hourly doses and calculated annual doses for three of the locations are provided in Table 8.

<b>Table 8</b> <b>Gamma Radiation Surveys Results and</b> <b>Calculated Annual Doses - Roadways</b>			
Road Location	Hourly Dose Including Background	Hourly Dose Not Incl. Background	Annual Dose (mRem/yr)
1	190 uR/hr	184 uR/hr	129
2	180 uR/hr	174 uR/hr	122
3	190 uR/hr	184 uR/hr	129

**Conclusion: None of the roadways sampled exceeded the recommended gamma radiation dose criteria of 500 mRem/yr.**

### Radon Sampling

EPA tested four home interiors for radon; all results were below the recommended 4 pCi/L level.

**Conclusion: Phosphate slag is not producing unacceptable levels of radon inside of residences.**

### Enforcement Activities

EPA has verified through information provided by Stauffer Management Co., local citizens, and a national railroad company, that slag materials were taken from the site and used as construction material in offsite areas. The extent of distribution is unknown at this time.

In addition, EPA has determined that another plant in Nichols, FL manufactured elemental phosphorous using the same process, and distributed slag in the same manner as was done by Stauffer Chemical Company and its predecessor, in the same time period. The extent of distribution from this plant is also unknown. Additional potential sources of slag material may also exist.

**Conclusion: Slag has been distributed by Stauffer Chemical Co., its predecessor. The extent of distribution is unknown. A similar elemental phosphorous plant in Nichols, Florida also distributed slag material.**

### Onsite vs. Offsite Slag Fingerprinting/Comparison

EPA Region 4 sent one sample from a residential basement concrete slab, one sample from a residential roadway, and one sample from the on-site slag field, collected during the July sampling event, to the Richard Smith, Consulting Scientist, Lockheed-Martin Idaho Technologies Co., Idaho National Engineering Laboratory, for visual and microscopic "fingerprinting." Dr. Smith indicated that the offsite samples were "visually indistinguishable" from the on-site slag sample.

Dr. Smith recommended that EPA Region 4 identify other, nearby plants that manufactured elemental phosphorous using the same process (such as the one in Nichols, FL and possibly others). If their source mines, manufacturing processes, and methods for cooling the slag were the same manner as was done at the Stauffer plant, then an in-depth geochemical comparison may be performed to distinguish between their respective slags. However, even a geochemical comparison is not a guarantee.

**Conclusion: The materials sampled undoubtedly contain phosphate slag; however, the source has not been definitively determined.**

### **ATSDR PUBLIC HEALTH ASSESSMENT**

The ATSDR completed a public health assessment and will distributed it concurrently with EPA's distribution of this fact sheet. In summary, the ATSDR notes that there is a completed exposure pathway to ionizing radiation ( radium-226) and heavy metals. However, they do not consider the presence of these contaminants in driveways, roadways, or yards to pose a public health threat. In addition only one home exceeds the recommended screening criteria for indoor gamma radiation. ATSDR recommends:

- 1) The resident of the one home limit time in the affected areas (primarily the basement).
- 2) Public health education be provided to assist the public in understanding that slag materials pose no public health hazard.

### **SUMMARY OF RESULTS**

The following summary of results/conclusions can be applied only to the sampling locations evaluated. The sampling locations were "biased," based upon citizen requests and EPA identification of "hot spots."

Phosphate slag is present in the offsite area; however, the origin has not been definitively proven. At least one other plant exists in the area.

Roadways, Driveways, and Yard Soil: Gamma radiation doses, and radiological and non-radiological contaminant concentrations are elevated above background levels but are within the screening criteria established for this analysis.

Home Interiors: Several homes have shown elevated levels of gamma radiation doses; however, only one home exceeds the recommended criteria.

The ATSDR does not consider the offsite slag to pose a public health threat.

### **CONCLUSION**

Based upon the information evaluated, combined with the surveys and analyses conducted by the FDEP, DOH-BRC, and the ATSDR, EPA has

determined that no Superfund action is required in the offsite areas.

The Florida Department of Health is the governing authority over radiation in the state of Florida. They can address any concerns regarding radiation in your area.

## **SOURCES**

State of Florida Administrative Code Section 64E-5.301

State of Florida Administrative Code Section 62-785

"Public Health Assessment, Stauffer Chemical Superfund Site Vicinity Properties, Tarpon Springs and Holiday, Florida," Agency for Toxic Substances and Disease Registry, Division of Health Assessment and consultation, December 1998

"Phosphorous Slag Identification in Construction Materials from the Tarpon Springs Area, Florida" Richard P. Smith, PhD, Lockheed-Martin Idaho Technologies Company, Revision 1, November 1, 1998

"Risk Assessment Guidance for Superfund Volume 1, Human Health Evaluation Manual (Part A), Interim Final," EPA/540/1-89-002, December 1989

"Risk Assessment Guidance for Superfund: Volume 1- Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim," U.S. EPA Publication 9285.7-01B, December 1991

"Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," OSWER Directive 9200.4-18, August 1998

Letter dated February 5, 1992 from Robert C. Williams, P.E., Director, Division of Health Assessment and Consultation, to Mr. Charles Walters, Hazardous Waste Management, Agency for Toxic Substances and Disease Registry regarding EPA Region III activities at the Austin Avenue Radiation Sites in Landsdowne, PA

"A Citizen's Guide to Radon (Second Edition), The Guide to Protecting Yourself and Your Family from Radon," EPA Office of Air and Radiation, EPA Document No. 402-K92-001, May 1992

## **HOW DO I FIND OUT MORE?**

EPA maintains an information repository at the Tarpon Springs Public Library which contains important documents about the Stauffer site:

Craig Park Branch  
Springs Boulevard  
Tarpon Springs, Florida 34689  
(813) 942-5613

In addition, if you would like more information or have questions about the Stauffer site, please contact:

John Blanchard  
or  
Carlean Wakefield  
U.S. Environmental Protection Agency  
61 Forsyth Street, SW  
Atlanta, Georgia 30303

1-(800) 435-9234







United States Environmental Protection Agency  
Waste Management Division, SSMB  
61 Forsyth Street, SW  
Atlanta, Georgia, 30303

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